

INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES (IHRA) STATUS REPORT OF THE BIOMECHANICS WORKING GROUP

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INTRODUCTION

This report gives a summary of the activities of the International Harmonized Research Activities (IHRA) Working Group on Biomechanics Research. The Working Group was formed in 1997 after the IHRA Steering Committee meeting in Washington, DC, where the United States presented the NHTSA plan for the harmonization of biomechanics research. The focus of the group is to obtain international agreement on a framework and to develop a five year agenda for the harmonization of biomechanics research.

The first meeting of the Working Group on Biomechanics Research was held in Hanover, Germany, September 22, 1997, in conjunction with the IRCOB Conference. The delegates representing Japan, Europe, and North America were present with Mr. K. Ono representing Japan, Dr. J. Wismans and Dr. D. Cesari representing the EEVC, Mr. D. Dalmotas representing Canada, and Dr. F. Bandak representing the United States. The meeting produced agreement on the research priorities and on the development of a framework and a five year agenda for the world wide harmonization of biomechanics research.

PROCEEDINGS OF THE FIRST BIOMECHANICS WORKING GROUP MEETING

Each member opened with a discussion of his respective country's harmonization priorities and a brief description of on-going candidate research areas for harmonization.

Mr. Dalmotas emphasized the high priority of exploring sound alternatives as replacement candidates for the current HIC as a measure of closed head injury. He also reiterated the need for obtaining a biofidelic neck to alleviate the current response inadequacies that the current Hybrid III-type necks exhibit for rear impacts, child and small female representation, and combined neck loading assessment. Mr. Dalmotas informed the Working Group of Transport Canada's efforts to develop a means for interpreting output for

Hybrid III legs to satisfy the current urgencies in light of the absence of an alternative.

Mr. Ono presented the harmonization priorities for Japan emphasizing the need for harmonization of injury criteria and dummy development for side impact, child injury, frontal, and rear impact. He highlighted the differences in evaluation criteria between dummies and the existence of multiple dummies for the evaluation of the same type of restraint system. Mr. Ono also pointed out that it is necessary to insure that the leg has higher biofidelity for full frontal and offset impact conditions. He also indicated the desire for further international cooperation facilitating the development and eventual adoption of the THOR dummy.

Dr. Cesari discussed on-going research addressing the need for the establishment of head/brain and neck injury mechanisms and tolerances for the purpose of proposing testing specifications for motorcycle safety helmets. Dr. Wismans emphasized the need for research to identify injury mechanisms and provide low level neck response characterization for whiplash injury. He described on-going research in that area and in the area of side impact dummy biofidelity evaluation and enhancement. He announced the start of SID-2000, a 26 month program that will produce side impact dummy design enhancements and injury risk functions. He updated the Group on the whiplash research and the Advanced Crash Dummy Research for Injury Assessment in frontal test conditions (ADRIA) programs to address injury biomechanics and dummy development for whiplash injury and frontal impact injury respectively.

Dr. Bandak emphasized the future needs for the development of advanced frontal dummies and the current needs for cooperation on a set of up-to-date harmonized injury reference values for the family of Hybrid III dummies. He discussed NHTSA's on-going projects on head/brain and neck injury, chest injury, and ankle injury. He informed the Group of NHTSA's side

impact research and Hybrid III dummy (5th, 95th, 3 & 6 year old) testing and evaluation. He also emphasized the need for a harmonized biomechanics data exchange protocol and presented NHTSA's approach. Dr. Bandak also discussed the need for standardizing computer models and computer codes.

RECOMMENDATIONS AND RESEARCH PRIORITIES

The Working Group agreed on an order of biomechanics research priorities that best reflects the needs of the member countries as a group. A discussion of the priority research areas is given below.

Frontal Impact - In light of the areas of research on-going in the various member countries related to frontal impact biomechanics the Working Group recommended that high priority be given to head/brain/face, neck, chest/abdomen, and lower extremities injury research. The Group also recommended cooperation on the development and evaluation of the advanced frontal dummy (THOR) under development by NHTSA.

Side Impact - The Working Group recommended that high priority be given to the generation of a harmonized strategy for the development of advanced world side-impact dummies. Assessment of the state of the existing side impact dummies, supporting biomechanics, and injury data is on-going as part of programs within the member countries. This presents a significant leveraging opportunity for cooperation in the development of advanced dummies for side impact addressing the issues of injury criteria, biofidelity requirements, and dummy sizes.

Whiplash - The Working Group recommended cooperation in the area of neck injury criteria development including low level injury. Priority was recommended for research in injury mechanism, low level neck response characterization, dummy and test procedure development.

Child Dummies - The Working Group recommended evaluation of recent testing (conducted by the member countries) on current child dummies that will help form the basis for IHRA Working Group recommendations on the development of a family of advanced child dummies. The Working Group recommended a two year period for this evaluation.

Data Harmonization and Exchange - The Working Group recommended that the new database approach, under exploration by the NHTSA National Transportation Biomechanics Research Center, be evaluated by the member countries for possible acceptance as an additional mechanism for data exchange supporting harmonization.

Computer Modelling - The Working Group recommended the creation of a steering subgroup to work as part of the IHRA Biomechanics Working Group to oversee a two-year study for the evaluation of the current modelling activities on-going by the member countries. The Steering Sub-Group on Computer Modelling shall then recommend possible approaches to the harmonization of computer models and programs.

Industry Representation - The Working Group recommended that three industry representatives be invited as members of the IHRA Biomechanics Working Group with one member representing each of, North America and Australia, Japan, and Europe.

SECOND MEETING OF THE WORKING GROUP ON HARMONIZATION OF BIOMECHANICS RESEARCH

The second meeting of the IHRA Working Group on Biomechanics Research was held in Orlando, Florida, USA on November 12, 1997 in conjunction with the Stapp Conference. The meeting was attended by Dr. Wismans and Dr. Cesari representing the EEVC, Mr. Dalmotas representing Canada, Mr. Ono representing Japan, Mr. Seyer representing Australia, and Dr. Bandak representing the United States.

The topic of discussion at the second meeting of the IHRA Biomechanics Working Group was development of a harmonized side impact dummy. This topic was identified as a priority at the previous IHRA/BIO/WG meeting and was endorsed as an issue of priority at the IHRA Steering Committee meeting in Geneva in November, 1997. The position of the Working Group on this issue is given in the following section.

Harmonization of Side Impact Dummies - In the 1980's, the governments of the US and European countries developed dynamic side impact regulations, the US FMVSS 214 and the ECE Regulation 95. Intending to improve occupant side impact protection,

these regulations produced different test procedures, test devices, and injury criteria with the US and Europe specifying the use of the USSID and EUROSID respectively. The two procedures and two dummies and substantially different making harmonization to one global side impact standard quite a non-trivial task.

The state of world side impact regulation today (two standards / two dummies) has significant disadvantages particularly with the associated increases in vehicle development, safety, and testing costs. While the recognition of such disadvantages associated with different regulatory standards for different markets is quite apparent, little or no advancement of an agreement on a harmonized side impact regulation has occurred until recently. There now exists a worldwide recognition of the need to harmonize on a single side impact dummy to facilitate more economical development of safe vehicle designs that can be sold in the global market. This is an essential step in the worldwide harmonization of side impact standards.

Over the past few years several efforts have been initiated in the US to develop new side impact dummies, the BIOSID (by General Motors) and the SIDIIs (through USCAR). These two dummies have been used primarily by the industry as research tools for the purposes of in-house evaluation of vehicle designs. There are currently two new initiatives to build on current side impact dummy technology to develop advanced side impact dummies. One of the projects, sponsored by a European Commission, involving government and industry organizations was recently introduced and is referred to as SID2000. This project is expected to start January 1, 1998 and continue for a period of 26 months to (1) evaluate the SIDIIs and EUROSID1 dummies against the current state of biomechanics knowledge on side impact. (2) make recommendations to improve EUROSID, and (3) examine the need for dummy sizes other than the 50th percentile male.

The other project is based on work conducted over the past few years in the US and sponsored by USCAR for the development of the 5th percentile female side impact dummy, SIDIIIs. This project initially called for the use of this dummy to form a basis for the development of a new 50th percentile side impact dummy under the auspices of the ISO/TC22/SC12/WG5. The ISO WG5 project was initially moving on a separate track from the SID2000 project. However, a recent resolution passed during the November, 1997, ISO/TC22/SC12/WG5 meeting proposed the introduction of a strategy to merge these two initiatives for the purpose of producing a globally harmonized dummy.

The recommendation of the September, 1997, meeting of the IHRA Biomechanics Working Group to include side impact dummy development as a priority was taken up by the IHRA Steering Committee in November, 1997. Further steering committee discussions at that meeting resulted in acknowledgment that two separate dummy development efforts will lead to harmonization difficulties down the road. This is consistent with the notion that the issue of developing a harmonized SID should be a priority of the IHRA/BIO/WG. It is also believed that the IHRA/BIO/WG is the government forum that can enhance the likelihood of agreement on a harmonized dummy. The Working Group can facilitate the early development of an acceptable framework that serves as a basis for achieving a harmonized dummy. This allows the various contributions from all groups including ISO/TC22/SC12/WG5 and SID2000 to focus on a common plan of action. It is therefore recommended that the development of a world harmonized side impact dummy be conducted with the full participation of the IHRA Biomechanics Working Group as the representing body for IHRA.